



U.S. NUCLEAR REGULATORY COMMISSION

# STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

## 9.5.8 EMERGENCY DIESEL ENGINE COMBUSTION AIR INTAKE AND EXHAUST SYSTEM

### REVIEW RESPONSIBILITIES

Primary - ~~Power Systems Branch (PSB)~~ Plant Systems Branch (SPLB)<sup>1</sup>

Secondary - None

### I. AREAS OF REVIEW

The emergency diesel engine combustion air intake and exhaust system (EDECAIES) supplies combustion air of reliable quality to the diesel engines, and exhausts the products of combustion from the diesel engines to the atmosphere. The ~~PSB~~SPLB<sup>2</sup> reviews the system from the outside air intake to the combustion air supply lines connected to the diesel engine interface,<sup>1</sup> and from the exhaust connections at the diesel engine interface<sup>(1)</sup> to the discharge point outside the building to assure conformance with General Design Criteria 2, 4, 5, and 17.

1. The ~~PSB~~SPLB<sup>3</sup> reviews the EDECAIES to verify that:
  - a. The system design meets appropriate seismic design classification requirements and the components are designed, fabricated, erected, and tested to acceptable quality standards.
  - b. The essential portions of the system are housed in or on a seismic Category I structure that is capable of protecting the system from extreme natural phenomena and external missiles.

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(1)As defined by the engine manufacturer.

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### USNRC STANDARD REVIEW PLAN

Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.

Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555.

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- c. Each diesel engine has an independent combustion air intake and exhaust system.
  - d. The consequences of a single active failure in an engine combustion air intake or exhaust system will not lead to the loss of function of more than one diesel generator.
2. For those plants that designate an emergency diesel engine as an alternate ac power source, the SPLB will determine the adequacy of the EDECAIES to perform its function in the event of a station blackout.<sup>4</sup>
  2. ~~The PSB will determine the adequacy of the design, installation, inspection and testing of all electrical systems (sensing, control and power) required for proper system operation and will evaluate the protection provided to the electrical system from dust accumulation in SRP Section 8.3.1.~~<sup>5</sup>

#### Review Interfaces:<sup>6</sup>

SPLB also performs the following reviews under the SRP sections indicated:<sup>7</sup>

1. ~~The Auxiliary Systems Branch (ASB)~~SPLB determines that the EDECAIES is ~~in accordance with Branch Technical Position ASB 3-1 and MEB 3-1 for~~protected against cracks and breaks in high-energy and moderate-energy piping systems outside containment as part of its primary review responsibility for SRP Section 3.6.1.<sup>8</sup>
2. In the case of the diesel generator building ventilation system supplying the combustion air as well as building ventilation, ~~the ASB SPLB, upon request,~~<sup>9</sup> determines that the ventilation system meets the criteria of this SRP section as part of its primary review responsibility for SRP Section 9.4.5.
3. The SPLB performs the reviews for fire protection ~~are coordinated and performed by the Chemical Engineering Branch~~ as part of ~~their~~its primary review responsibility for SRP Section 9.5.1.<sup>10</sup>

In addition,~~the review of the EDECAIES,~~<sup>11</sup> the ~~PSB~~SPLB<sup>12</sup> will coordinate other branches' evaluations that interface with the overall review of the system as follows:

1. ~~The Structural Engineering Branch (SEB)~~Civil Engineering and Geosciences Branch (ECGB)<sup>13</sup> determines the acceptability of the design analyses, procedures, and criteria used to establish the ability of seismic Category I structures housing the system and supporting systems to withstand the effects of natural phenomena such as the safe shutdown earthquake (SSE), the probable maximum flood (PMF), and tornado missiles as part of its primary review responsibility for SRP Sections 3.3.1, 3.3.2, 3.5.3, 3.7.1 through 3.7.4, 3.8.4, and 3.8.5.
2. The Mechanical Engineering Branch (E<sup>14</sup>MEB) determines that system components, piping, and structures are designed in accordance with applicable codes and standards as part of its primary review responsibility for SRP Sections 3.9.1 through 3.9.3.

3. The E<sup>15</sup>MEB also determines the acceptability of the seismic and quality group classifications for system components as part of its primary review responsibility for SRP Sections 3.2.1 and 3.2.2.
4. The Materials and Chemical Engineering Branch (MTEB)(EMCB)<sup>16</sup> verifies, upon request, the compatibility of the materials of construction with service conditions.
5. The ~~Procedures and Test Review~~Quality Assurance and Maintenance Branch (HQMB) determines the acceptability of the preoperational and startup tests as part of its primary review responsibility for SRP Section 14.02<sup>17</sup>. The HQMB also performs the reviews for quality assurance ~~are coordinated and performed by the Quality Assurance Branch~~ as part of ~~their~~its primary review responsibility for SRP ~~Section~~Chapter 17.0.<sup>18</sup>
6. The Technical Specifications Branch (TSB) performs the reviews for technical specifications ~~are coordinated and performed by the Licensing Guidance Branch~~ as part of ~~their~~its primary review responsibility for SRP Section 16.0.<sup>19</sup>
7. The Electrical Engineering Branch (EELB) will determine the adequacy of the design, installation, inspection and testing of all electrical systems (sensing, control and power) required for proper system operation and will evaluate the protection provided to the electrical system from dust accumulation in SRP Section 8.3.1.<sup>20</sup> The EELB also determines the adequacy of proposed alternate ac sources for station blackout as part of its primary review responsibility for SRP Sections 8.2 and 8.4 (proposed).<sup>21</sup>

~~The reviews for fire protection, technical specifications, and quality assurance are coordinated and performed by the Chemical Engineering Branch, Licensing Guidance Branch, and Quality Assurance Branch as part of their primary review responsibility for SRP Sections 9.5.1, 16.0, and 17.0, respectively.~~<sup>22</sup>

For those areas of review identified above as being part of ~~the primary review responsibility of other branches~~reviews under other SRP sections, the acceptance criteria necessary for the review and their methods of application are contained in the referenced SRP section ~~of the corresponding primary branches~~.<sup>23</sup>

## II. ACCEPTANCE CRITERIA

Acceptability of the design of the emergency diesel generator combustion air intake and exhaust system, as described in the applicant's safety analysis report (SAR), is based on specific regulations,<sup>24</sup> general design criteria and regulatory guides and industry standards. Information obtained from other Federal agencies and reports, military specifications, available technical literature, and operational performance data obtained from similarly designed systems at other plants having satisfactory operational experience will also be utilized to determine EDECAIES acceptability.

The design of the EDECAIES is acceptable if the integrated design of the system is in accordance with the following criteria:

1. General Design Criterion 2, as related to the ability of structures housing the system and system components to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, as established in Chapters 2 and 3 of the SAR. Acceptance is based on meeting Appendix Position 13 of Regulatory Guide 1.117 as related to the protection of structures, systems, and components (SSC)<sup>25</sup> important to safety from the effects of tornado missiles.
2. General Design Criterion 4, with respect to structures housing the systems and the system components being capable of withstanding the effects of external missiles and internally generated missiles, pipe whip, and jet impingement forces associated with pipe breaks. Acceptance is based on meeting Position C.1 of Regulatory Guide 1.115 as related to the protection of ~~structures, systems, and components~~ SSC<sup>26</sup> important to safety from the effects of turbine missiles.
3. General Design Criterion 5, as related to shared systems and components important to safety being capable of performing required safety functions.
4. General Design Criterion 17 as related to the capability of the diesel engine ~~air starting~~ combustion air intake and exhaust system<sup>27</sup> to meet independence and redundancy criteria. Acceptance is based on meeting the following specific criteria:
  - a. Regulatory Guide 1.9 as related to the design of the diesel engine combustion air intake and exhaust systems.
  - ~~b. Branch Technical Position ICSB-17 (PSB) as related to diesel engine combustion air intake and exhaust systems' protective interlocks during accident conditions.~~<sup>28</sup>
  - eb<sup>29</sup>. NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability-" (Reference 10).<sup>30</sup>
  - dc<sup>31</sup>. ANSI/IEEE Standard<sup>32</sup> 387 (Reference 11)<sup>33</sup> as related to the design of the diesel engine combustion air intake and exhaust system.
  - ed<sup>34</sup>. Diesel Engine Manufacturers Association (DEMA) Standard (Reference 12)<sup>35</sup> as related to the design of the diesel combustion air intake and exhaust system.
  - fe<sup>36</sup>. Each emergency diesel engine should be provided with an independent and reliable combustion air intake and exhaust system. The system should be sized and physically arranged such that no degradation of engine function will be experienced when the diesel generator set is required to operate continuously at the maximum rated power output.
  - gf<sup>37</sup>. The combustion air intake system shall be provided with a means of reducing airborne particulate material over the entire time period that emergency power is required assuming the maximum airborne particulate concentration at the combustion air intake.

hg<sup>38</sup>. Suitable design precautions have been taken to preclude degradation of the diesel engine power output due to exhaust gases and other dilutents<sup>39</sup> that could reduce the oxygen content below acceptable levels.

Plants that have emergency ac sources in excess of minimum redundancy requirements for loss-of-offsite-power conditions may use one of the existing emergency sources as an alternate ac (AAC) power source for the purposes of coping with a station blackout, provided it meets the applicable criteria for an AAC source. For a plant relying on an emergency diesel engine as an AAC power source, the design of the combustion air intake and exhaust system for that engine is acceptable if it meets 10 CFR Part 50.63, "Loss of All Alternating Current Power," paragraph (a)(2), and Regulatory Guide 1.155, Position C.3.<sup>40</sup>

Technical Rationale:<sup>41</sup>

The technical rationale for application of the above acceptance criteria to the emergency diesel engine combustion air intake and exhaust system is discussed in the following paragraphs.

1. GDC 2 requires that SSC important to safety be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform the safety function. Regulatory Guide 1.117 provides the methods acceptable to the staff for tornado design classification of structures, systems and components important to safety. The safety function of the EDECAIES is to supply quality combustion air to the emergency diesel engine. A quality combustion air supply is necessary to ensure the capability of the emergency diesel engine to provide prompt restoration of ac power to safety related components that are necessary to maintain the integrity of the reactor coolant pressure boundary, to safely shutdown the reactor and maintain it in a safe shutdown condition, and to prevent or mitigate the consequences of accidents. The EDECAIES is an integral part of the emergency diesel generator system. Therefore, compliance with the requirements of GDC 2 provides assurance that emergency ac power will be available to safety-related components in the event of a loss of offsite power resulting from natural phenomena events.
2. GDC 4 requires that SSC important to safety be designed to withstand the dynamic effects of pipe ruptures such as pipe whip and jet impingement, and externally or internally generated missiles. The safety function of the EDECAIES is to provide combustion air to the emergency diesel engines under all operating conditions, such as following a loss of offsite power. In order to ensure the availability of emergency ac power, the EDECAIES must be capable of supplying combustion air under the expected operational and postulated accident conditions for the plant. These conditions include consideration of the dynamic effects of equipment failures such as pipe ruptures and turbine missiles, and events and conditions external to the plant. Compliance with GDC 4 provides assurance that the dynamic effects of equipment failures, and events external to the plant, will not affect the capability of the EDECAIES to provide combustion air to the emergency diesel engines.

3. GDC 5 prohibits the sharing of SSC important to safety among nuclear power units unless it can be demonstrated that such sharing will not significantly impair their ability to perform their safety functions, including in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining unit. The safety function of the EDECAIES is to provide combustion air to the emergency diesel engines under all operating conditions. In order to ensure the availability of emergency ac power to safety-related components, the EDECAIES must be designed to perform this safety function in each unit regardless of events, failures, and conditions in the other unit(s). Compliance with GDC 5 provides assurance that equipment failures and events occurring in one unit of the site will not propagate to other units of the site.
4. GDC 17, in relevant part, requires provision of an onsite electric power system to permit the functioning of structures, systems and components important to safety. GDC 17 requirements include that the onsite electric power system have sufficient independence and redundancy to perform their safety functions assuming a single failure. Typically, the emergency diesel generator system is the onsite electric power system relied upon to meet these requirements. The diesel engine combustion air intake and exhaust system is integral to the emergency diesel generator system. Regulatory Guide 1.9 provides regulatory positions with regard to emergency diesel engine and combustion air system design criteria and features applicable to GDC 17 compliance. Meeting the GDC 17 requirements provides assurance that electric power will be available for systems necessary to: 1) prevent fuel damage in the event of anticipated operational occurrences; and 2) maintain core cooling and containment integrity in the event of postulated accidents.
5. 10 CFR 50.63 requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout (i.e., loss of the offsite electric power system concurrent with reactor trip and unavailability of the onsite emergency ac electric power system). Paragraph (a)(2) of 50.63 establishes the conditions under which provision of an alternate ac (AAC) power source will constitute acceptable capability to withstand station blackout. Regulatory Guide 1.155 describes a method acceptable to the NRC staff for complying with 10 CFR 50.63. Plants that have emergency ac sources in excess of minimum redundancy requirements for loss-of-offsite-power conditions may use one of the existing emergency sources as an AAC power source for the purposes of coping with a station blackout. Any emergency diesel engine designated as an AAC power source is dependent on support systems such as the engine combustion air system. Compliance with 10 CFR 50.63 and the positions of Regulatory Guide 1.155 regarding the ability to cope with a station blackout provides additional defense-in-depth against unacceptable offsite radiological consequences should both offsite and onsite emergency ac power systems fail concurrently.

### III. REVIEW PROCEDURES

The procedures below are used during the construction permit (CP) review to determine that the design criteria and bases and the preliminary design as set forth in the preliminary safety analysis report meet the acceptance criteria given in subsection II of this SRP section. For the review of operating license (OL) applications, the procedures are utilized to verify that the initial design

criteria and bases have been appropriately implemented in the final design as set forth in the final safety analysis report.

The review procedures for OL applications include a determination that the content and intent of the technical specifications prepared by the applicant are in agreement with the requirements for system testing, minimum performance, and surveillance developed as a result of the ~~LGBT~~TSB<sup>42</sup> review, as indicated in subsection I of this SRP section.

The primary reviewer will coordinate this review with the other branches' areas of review stated in subsection I of this SRP section. The primary reviewer obtains and uses such input as required to assure that this review procedure is complete.

The reviewer will select and emphasize material from the paragraphs below, as may be appropriate for a particular case.

1. The SAR is reviewed to determine that the EDECAIES is a dedicated system and that the description and related diagrams clearly delineate the system components and the modes of system operation. The ~~SEB-ECGB~~<sup>43</sup> reviews the seismic design bases and the EMEB<sup>44</sup> reviews the quality and seismic classification as indicated in subsection I of this SRP section. The ~~PSB~~SPLB<sup>45</sup> assures that essential portions of the EDECAIES are classified Quality Group C and seismic Category I. Components and system descriptions in the SAR that identify mechanical and performance characteristics are reviewed to verify that the above seismic and quality classifications have been included and that the P&IDs indicate any points of change at the system and/or system component interfaces.
2. The SAR is reviewed to ascertain that sufficient space has been provided around the components to permit inspection of the system components.
3. The SAR is reviewed to assure that the arrangement and location of the combustion air intake and exhaust are such that dilution or contamination of the intake air by exhaust products, fire extinguishing (gaseous) medium, or other gases that may intentionally or accidentally be released on site will not preclude operation of the diesel engines at rated power output, or cause engine shutdown as a consequence of any meteorological or accident condition.
4. The SAR is reviewed to verify that if the intake air flow or engine exhaust is dependent upon the actuation of flow control devices (louvers, dampers), the EDECAIES will function if there is a failure of an active component.
5. The SAR is reviewed to assure that system components exposed to atmospheric conditions (dust storms, rain, ice, snow) are protected from possible clogging during standby or operation of the system.
6. The reviewer verifies that the system will function as required in the event of other adverse natural phenomena. The reviewer evaluates the system, using engineering judgment and failure modes and effects analyses to determine that:

- a. The failure of nonessential portions of the system or of other systems not designed to seismic Category I requirements and located close to essential portions of the system, or of non-seismic Category I structures that house, support, or are close to essential portions of the EDECAIES, will not preclude operation of the system. Reference to SAR sections describing site features and the general arrangement and layout drawings will be necessary, as well as the SAR tabulation of seismic design classifications for structures and systems. Statements in the SAR that verify that the above conditions are met are acceptable.
  - b. The essential portions of the system are protected from the effects of floods, hurricanes, tornadoes, and internally or externally generated missiles. Flood protection and missile protection criteria are discussed and evaluated in detail under the SRP sections for Chapter 3 of the SAR. The location and the design of the systems and structures are reviewed to determine that the degree of protection provided is adequate. A statement to the effect that the system is located in a seismic Category I structure that is tornado missile and flood protected, or that components of the system will be located in individual cubicles or rooms that will withstand the effects of both flooding and missiles is acceptable.
  - c. The essential portions of the system are protected from the effects of high- and moderate-energy line breaks. Layout drawings are reviewed to assure that no high- or moderate-energy piping systems are close to the essential portions of the system, or that protection from the effects of failure will be provided. The means of providing such protection will be given in Section 3.6 of the SAR and procedures for reviewing this information are given in the corresponding SRP sections.
7. The descriptive information, P&IDs, EDECAIES layout drawings, and failure modes and effects analyses in the SAR are reviewed to assure that functional requirements of the system will be met following design basis accidents assuming a concurrent single active component failure. The reviewer evaluates the effects of failure of components, traces the availability of redundant components on system drawings, and checks that the SAR contains verification that the system functional requirements are met.
8. The SAR is reviewed to assure that provisions have been made in the diesel generator combustion air intake design to minimize the ingestion of airborne particulate material over the entire time period that emergency power is required. The reviewer also verifies the following:
  - a. That the intake design is reviewed to assure that the bottom of the intake opening is located a minimum of 6.1 m (20 feet)<sup>46</sup> above grade.
  - b. That the SAR is reviewed to assure that provisions have been made to minimize the generation of dust, particularly in multiunit plants when one unit is operating and the other is under construction (abnormal generation of dust).



Dust control in the diesel generator rooms entering via the ventilation system is reviewed by ASBSPLB<sup>47</sup> as part of its review responsibility for SRP Section 9.4.5. In SRP Section 8.3.1, PSBEELB<sup>48</sup> reviews the SAR to assure that the electrical equipment associated with starting the diesel generators (e.g., auxiliary relay contacts, control switches, individually or panel mounted) are protected from dust accumulation, other deleterious material entering diesel generator room, and dust generated from concrete floors and walls.

9. For those plants that will use an emergency diesel generator as the AAC source in response to a station blackout event, the reviewer verifies the adequacy of the EDECAIES to support this functional capability, independent of preferred and onsite emergency ac power, by comparing system design with regulatory position C.3.3.5 of Regulatory Guide 1.155.<sup>49</sup>

For standard design certification reviews under 10 CFR 52, the procedures above should be followed, as modified by the procedures in SRP Section 14.3 (proposed), to verify that the design set forth in the standard safety analysis report, including inspections, tests, analysis, and acceptance criteria (ITAAC), site interface requirements and combined license action items, meet the acceptance criteria given in subsection II. SRP section 14.3 (proposed) contains procedures for the review of certified design material (CDM) for the standard design, including the site parameters, interface criteria, and ITAAC.<sup>50</sup> At the time of DC reviews the diesel engine vendor may not have been selected; therefore, the interfaces between the diesel engine and the support (auxiliary) systems may not be fully defined. Portions of the EDE and associated support systems design may be considered outside the scope of the design submitted by applicants for design certification. Portions of the design determined not to be within the DC scope are the responsibility of the applicant referencing the certified design. The DC applicant's submittal should provide a conceptual design and interface requirements for that portion of the design outside the scope of the DC as required by 10 CFR 52.47(a)(1)(vi-ix).<sup>51</sup>

#### IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided and his review supports conclusions of the following type, to be included in the staff's safety evaluation report:

The emergency diesel generator combustion air intake and exhaust system (EDECAIES) includes all components and piping of the air intake system from the atmospheric air intake to its connection to the engine interface and all components and piping of the exhaust system from its connection to the engine interface to the point where it exhausts to the atmosphere. The scope of the review of the EDECAIES for the \_\_\_\_\_ plant included layout drawings, piping and instrumentation diagrams, and descriptive information for the system and auxiliary supporting systems that are essential to its safe operation. The essential portions of the EDECAIES that are necessary for the safe shutdown of the reactor or necessary to mitigate the consequences of an accident are designed to seismic Category I and Quality Group C.

The staff concludes that the design of the emergency diesel generator combustion air intake and exhaust system is acceptable and meets the requirements of GDC 2, 4, 5, and 17. This conclusion is based on the following:

1. The applicant has met the requirements of GDC 2, "Design Bases for Protection Against Natural Phenomena," with respect to the ability of structures housing the EDECAIES and the system itself to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, and GDC 4, "Environmental and ~~Missile~~Dynamic Effects<sup>52</sup> Design Bases," with respect to structures housing the system and the system itself being capable of withstanding the effects of externally and internally generated missiles, pipe whip, and jet impingement forces associated with pipe breaks. The EDECAIES is housed in a seismic Category I structure which provides protection from the effects of tornadoes, tornado missiles, turbine missiles, and floods. The exposed portions of the system are also protected from tornadoes, tornado missiles, turbine missiles, and floods. This meets the positions of Regulatory Guides 1.115, "Protection Against Low-Trajectory Turbine Missiles," Position C.1 and 1.117, "Tornado Design Classification," Appendix Position 13.
2. The applicant has met the requirements of GDC 5, "Sharing of Structures, Systems and Components," with respect to the capability of shared systems and components important to safety to perform required safety functions. Each unit of the \_\_\_\_\_ plant has its own emergency diesel generators, whose EDECAIES is not shared between the diesel generators.
3. The applicant has met the requirements of GDC 17, "Electric Power Systems," with respect to the capability of combustion air intake and exhaust system to meet independence and redundancy criteria. Each EDECAIES is independent and physically separated from the other system serving the redundant diesel generators. Single failure in any one of the two systems will affect only the associated diesel generator. Each system is sized and physically arranged such that no degradation of engine function will be experienced when the diesel generator set is required to operate continuously at maximum rated power output. The air intakes are located \_\_\_\_\_ meters (\_\_\_\_feet)<sup>53</sup> above plant grade and adequate filters are provided to minimize airborne particulate material (dust) from entering the system. Suitable design precautions have been taken to preclude degradation of the diesel engine power output due to recirculation of exhaust gases and ingestion of other dilutents<sup>54</sup> that would reduce the oxygen content below acceptable levels. This meets the position of Regulatory Guide 1.9, "Selection, Design, and Qualification and Testing of Emergency Diesel Generator Units Used as Standby Class 1E (Onsite)"<sup>55</sup> Electric Power Systems at Nuclear Power Plants." The applicant has also met the positions of ~~Branch Technical Position ICSB-17 (PSB), "Diesel Generator Protective Trip Circuit Bypasses," and~~<sup>56</sup> NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability." The applicant has met the requirements of the following industry standards: IEEE Standard 387, "IEEE Standard Criteria for Diesel Generator

Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," and Diesel Engine Manufacturers Associated (DEMA) Standard.

If the applicant proposes to designate an emergency diesel generator as the AAC source in response to a station blackout event, the following finding should be included:

The applicant has met the requirements of 10 CFR Part 50.63, "Loss of All Alternating Current Power," relevant to the design of the EDECAIES for the Alternate ac power source. The EDECAIES for the Alternate ac power source can perform its functions for its associated diesel generator independent of preferred and onsite emergency ac power for the specified duration of the station blackout. This meets the applicable positions of Regulatory Guide 1.155 "Station Blackout."<sup>57</sup>

For design certification reviews, the findings will also summarize, to the extent that the review is not discussed in other safety evaluation report sections, the staff's evaluation of inspections, tests, analyses, and acceptance criteria (ITAAC), including design acceptance criteria (DAC), site interface requirements, and combined license action items that are relevant to this SRP Section.<sup>58</sup>

## V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

This SRP section will be used by the staff when performing safety evaluations of license applications submitted by applicants pursuant to 10 CFR 50 or 10 CFR 52.<sup>59</sup> Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications docketed six months or more after the date of issuance of this SRP section.<sup>60</sup>

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides and NUREG. ~~The implementation schedule for the new position in Section III, item 8a, above, shall be applied only to CP applications.~~ CP applicants docketed on or after July 1981 must provide an implementation schedule for the positions in Section III, item 8a.<sup>61</sup>

## VI. REFERENCES

1. 10 CFR 50.63, "Loss of all alternating current power."<sup>62</sup>

12.<sup>63</sup> 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."

23. 10 CFR Part 50, Appendix A, General Design Criterion 4, "Environmental and ~~Missile~~Dynamic Effects<sup>64</sup> Design Bases."
34. 10 CFR Part 50, Appendix A, General Design Criterion 5, "Sharing of Structures, Systems, and Components."
45. 10 CFR Part 50, Appendix A, General Design Criterion 17, "Electric Power Systems."
56. Regulatory Guide 1.9 "Selection, Design, ~~and~~ Qualification and Testing of Emergency Diesel Generator Units Used as Standby Class 1E (Onsite) Electric Power Systems at Nuclear Power Plants."<sup>65</sup>
- ~~6. Regulatory Guide 1.68, "Initial Test Programs for Water-Cooled Reactor Power Plants."<sup>66</sup>~~
7. Regulatory Guide 1.115, "Protection Against Low-Trajectory Turbine Missiles."
8. Regulatory Guide 1.117, "Tornado Design Classification."
9. Regulatory Guide 1.155, "Station Blackout."<sup>67</sup>
- ~~9. Branch Technical Position ASB 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," attached to SRP Section 3.6.1.<sup>68</sup>~~
- ~~10. Branch Technical Position MEB 3-1, "Postulated Break and Leakage Locations in Fluid System Piping Outside Containment," attached to SRP Section 3.6.2.<sup>69</sup>~~
- ~~11. Branch Technical Position ICSB-17 (PSB), "Diesel-Generator Protective Trip Circuit Bypasses" attached to SRP Section 8.3.2 Appendix 8A.<sup>70</sup>~~
- 1410<sup>71</sup>. NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability-," University of Dayton Research Institute; UDR-TR-79-07; February 1979.<sup>72</sup>
- 1211<sup>73</sup>. ANSI/IEEE Standard 387, "IEEE Standard Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations-," American National Standards Institute.<sup>74</sup>
- 1312<sup>75</sup>. Diesel Engine Manufacturers Association (DEMA) Standard<sup>76</sup> 1974<sup>77</sup>.

**SRP Draft Section 9.5.8**  
Attachment A - Proposed Changes in Order of Occurrence

Item numbers in the following table correspond to superscript numbers in the redline/strikeout copy of the draft SRP section.

Item	Source	Description
1.	Current PRB names and abbreviations.	Editorial change to reflect current PRB names and responsibilities for SRP Section 9.5.8.
2.	Current PRB names and abbreviations.	Editorial change to reflect current PRB names and responsibilities for SRP Section 9.5.8.
3.	Current PRB names and abbreviations.	Editorial change to reflect current PRB names and responsibilities for SRP Section 9.5.8.
4.	<b>Integrated Impact 256.</b>	Added provisions to review the EDECAIES with regard to station blackout requirements for those plants that designate an EDE as an alternate ac power source.
5.	Editorial item.	Prior to organizational changes, the Power Systems Branch (PSB) had responsibility for both Section 9.5.8 and Section 8.3.1. This paragraph was moved under "Review Interfaces" (item 5.) since the SPLB is now responsible SRP Section 9.5.8, but is not responsible for reviews conducted per SRP Section 8.3.1. Section 8.3.1 is now the responsibility of the Electrical Engineering Branch (EELB).
6.	SRP-UDP format item.	Added "Review Interfaces" heading to Areas of Review. Reformatted existing description of review interfaces in numbered format to describe how the SPLB reviews aspects of the EDECAIES under other SRP sections and how other branches support the review.
7.	Editorial.	Added a lead-in sentence to those additional SRP sections reviewed by the same PRB responsible for SRP Section 9.5.8 in accordance with SRP-UDP guidance.
8.	Current PRB names and abbreviations.	Editorial change to separate text and reflect current PRB names and responsibilities for SRP Section 3.6.1. References to BTPs were deleted to simplify the text. The BTPs will be reviewed as part of the review interface for the associated SRP Section ,and therefore there is no need to specify them separately.
9.	Current PRB names and abbreviations.	Editorial change to separate text and reflect the current PRB name and responsibility for SRP Section 9.4.5.
10.	Current PRB names and abbreviations.	Editorial change to reflect current PRB names and responsibilities for SRP section 9.5.1.
11.	Editorial.	Revised the lead-in sentence for those areas of review for which the PRB for SRP Section 9.5.8 must interface with other PRBs. This change is consistent with SRP-UDP format guidance.

**SRP Draft Section 9.5.8**  
Attachment A - Proposed Changes in Order of Occurrence

Item	Source	Description
12.	Current PRB names and abbreviations.	Editorial change to reflect current PRB names and responsibilities for SRP section 9.5.8
13.	Current PRB names and abbreviations.	Editorial change to separate text and reflect current PRB names and responsibilities for SRP sections 3.3.1, 3.3.2, 3.5.3, 3.7.1 through 3.7.4, 3.8.4 and 3.8.5.
14.	Current PRB names and abbreviations.	Editorial change to separate text and reflect current PRB names and responsibilities for SRP sections 3.9.1 through 3.9.3.
15.	Current PRB names and abbreviations.	Editorial change to separate text and reflect current PRB names and responsibilities for SRP sections 3.2.1 and 3.2.2.
16.	Current PRB names and abbreviations.	Editorial change to separate text and reflect current PRB names and responsibilities.
17.	Current PRB names and abbreviations and Editorial changes.	Editorial change to separate text, revise the reference to SRP Section 14.0 to 14.2, and reflect current PRB names and responsibilities for SRP Section 14.2.
18.	Current PRB names and abbreviations.	Editorial change to separate text and reflect current PRB names and responsibilities for SRP Chapter 17. Note that "Section 17.0" was changed to "Chapter 17" since there is no Section 17.0 and the review interface encompasses the entire Chapter.
19.	Current PRB names and abbreviations.	Editorial change to separate text and reflect current PRB names and responsibilities for SRP Section 16.0.
20.	Editorial item, PRB names and abbreviations.	Prior to organizational changes, the Power Systems Branch (PSB) had responsibility for both Section 9.5.8 and Section 8.3.1. This paragraph was moved from item 2 of Areas of Review to a review interface since the SPLB is now responsible SRP Section 9.5.8, but is not responsible for reviews conducted per SRP Section 8.3.1. Section 8.3.1 is now the responsibility of the Electrical Engineering Branch (EELB).
21.	SRP-UDP Integration of SBO Issues	Added interface describing reviews of AAC sources by EELB under SRP Section 8.2, Appendix 8-C and SRP Section 8.4.
22.	SRP-UDP format item, and PRB names and abbreviations.	This paragraph was incorporated into the review interface section of Areas of Review to be consistent with SRP-UDP required format which uses a number/paragraph format to distinguish individual reviews performed by other PRBs. PRB names are revised within the review interface subsection to reflect current names and responsibilities.
23.	SRP-UDP format item	Revised using standard text to address both the interfaces listed with other SPLB reviews and with other PRBs.

**SRP Draft Section 9.5.8**  
Attachment A - Proposed Changes in Order of Occurrence

Item	Source	Description
24.	<b>Integrated Impact 256.</b>	Added "regulations" to the list of document types used for acceptance criteria to accommodate addition of 10 CFR 50.63.
25.	Editorial.	Added the acronym "SSC" for "structures, systems, and components to simplify the text.
26.	Editorial.	Added the acronym "SSC" for "structures, systems, and components to simplify the text.
27.	Editorial.	Acceptance Criteria II.4 incorrectly refers to the "air starting system". This has been changed to the combustion air intake and exhaust system.
28.	<b>Integrated Impact 254.</b>	Deleted Acceptance Criteria II.4.b associated with BTP ICSB-17 which has been superseded by Regulatory Guide 1.9.
29.	Editorial item.	Renumbered the Acceptance Criteria due to deletion of BTP ICSB-17.
30.	SRP-UDP format item. Reformat reference citations.	Added parenthetical reference identification to the existing citation of NUREG/CR 0660.
31.	Editorial item.	Renumbered the Acceptance Criteria due to deletion of BTP ICSB-17.
32.	<b>Integrated Impact 798.</b>	Revised the title of IEEE 387 to add the ANSI designation and to abbreviate the term "Standard" as "Std" to be consistent with IEEE usage.
33.	SRP-UDP format item. Reformat reference citations.	Added parenthetical reference identification to the existing citation of IEEE 387.
34.	Editorial item.	Renumbered the Acceptance Criteria due to deletion of BTP ICSB-17.
35.	SRP-UDP format item. Reformat reference citations.	Added parenthetical reference identification to the existing citation of DEMA Standard.
36.	Editorial item.	Renumbered the Acceptance Criteria due to deletion of BTP ICSB-17.
37.	Editorial item.	Renumbered the Acceptance Criteria due to deletion of BTP ICSB-17.
38.	Editorial item.	Renumbered the Acceptance Criteria due to deletion of BTP ICSB-17.
39.	Editorial	Corrected the word "dilutents" to be "dilutents".
40.	<b>Integrated Impact 256.</b>	Revised the Acceptance Criteria to include 10 CFR 50.63 and Regulatory Guide 1.155 regarding station blackout.

**SRP Draft Section 9.5.8**  
Attachment A - Proposed Changes in Order of Occurrence

Item	Source	Description
41.	SRP-UDP format item.	Technical Rationale were developed for the Acceptance Criteria in accordance with the format requirements for the SRP-UDP.
42.	Current PRB names and abbreviations.	Editorial change to reflect current PRB names and responsibilities.
43.	Current PRB names and abbreviations.	Editorial change to reflect current PRB names and responsibilities.
44.	Current PRB names and abbreviations.	Editorial change to reflect current PRB names and responsibilities.
45.	Current PRB names and abbreviations.	Editorial change to reflect current PRB names and responsibilities for SRP section 9.5.8.
46.	SRP-UDP format item. Implementation of NRC Metrication Policy.	The existing value of 20 feet was converted to 6.1 meters.
47.	Current PRB names and abbreviations.	Editorial change to reflect the current PRB name and responsibility for SRP Section 9.4.5.
48.	Current PRB names and abbreviations.	Editorial change to reflect the current PRB name and responsibility for SRP Section 8.3.1.
49.	<b>Integrated Impact 256.</b>	Revised Review Procedures to include review for 10 CFR 50.63 and Regulatory Guide 1.155 requirements with regard to combustion air systems on emergency diesel generators used as alternate ac power sources for coping with station blackout.
50.	SRP integration format item	Added boiler-plate statement with regard to reviews performed in accordance with 10 CFR 52.
51.	10 CFR 52 applicability changes. Potential Impact Nos. 24330 and 24331.	Added a paragraph to address reviews for design certification applicants. Some portions of the design and interface between the diesel engine and the support systems are dependent on the selection of the diesel engine vendor. Since these design and interface criteria may not be available as part of the DC review, they are the responsibility of the applicant referencing the certified design.
52.	SRP-UDP format item. Verification of references.	Revised the title for GDC 4.
53.	Editorial.	The term "meters" was added and feet was placed in parentheses to be consistent with the implementation of the NRCs metrication policy and the associated changes made to english units in the Review Procedures.
54.	Editorial	Corrected the word "dilutents" to be "dilutents".
55.	Editorial Item.	Updated title of Regulatory Guide 1.9.



**SRP Draft Section 9.5.8**  
Attachment A - Proposed Changes in Order of Occurrence

Item	Source	Description
56.	<b>Integrated Impact 254.</b>	Deleted text in Evaluation Findings associated with BTP ICSB-17 which was superseded by Regulatory Guide 1.9.
57.	<b>Integrated Impact 256.</b>	Added an Evaluation Finding for those plants that will use an emergency diesel generator as the alternate AC source in response to a station blackout event.
58.	10 CFR 52 applicability related editorial change.	Design Certification is mentioned as appropriate in those paragraphs of the SRP which discuss Construction Permit or Operating License reviews, in accordance with SRP-UDP requirements.
59.	SRP-UDP Format Item	Added boiler-plate statement indicating the applicability of the SRP to 10 CFR 52 license applications.
60.	SRP-UDP Format Item	Added boiler-plate statement describing the applicability of the SRP to existing and new applications.
61.	Editorial.	Sentence was reworded to clarify applicability of requirements.
62.	<b>Integrated Impact 256.</b>	Added reference to 10 CFR 50.63 regarding station blackout.
63.	Editorial	Reordered and renumbered references in accordance with SRP-UDP guidance.
64.	SRP-UDP format item. Verification of references.	Updated the title for GDC 4.
65.	Editorial item.	Renumbered reference and updated title of Regulatory Guide 1.9.
66.	Editorial item.	Deleted reference to Regulatory Guide 1.68 which is not mentioned in the text of the SRP Section.
67.	<b>Integrated Impact 256.</b>	Added reference to Regulatory Guide 1.155.
68.	Editorial.	The Branch Technical Position is only cited in the Areas of Review portion of SRP Section 9.5.8. This BTP will be reviewed through the interface with SRP Section 3.6.1, and therefore there is no need to cite or reference the BTP separately.
69.	Editorial.	The Branch Technical Position is only cited in the Areas of Review portion of SRP Section 9.5.8. This BTP will be reviewed through the interface with SRP Section 3.6.1, and therefore there is no need to cite or reference the BTP separately.
70.	<b>Integrated Impact 254.</b>	Deleted reference to BTP ICSB-17 which has been superseded by Regulatory Guide 1.9.

**SRP Draft Section 9.5.8**  
Attachment A - Proposed Changes in Order of Occurrence

Item	Source	Description
71.	Editorial.	Renumbered the reference due to the additional and deletion of preceding references.
72.	SRP-UDP format item. Reference verification.	Updated the reference to NUREG/CR-0660.
73.	Editorial.	Renumbered the reference due to the additional and deletion of preceding references.
74.	<b>Integrated Impact 798.</b>	Added the 1984 date to identify the applicable version and revised the title to include the ANSI designator and to abbreviate the term "Standard" to "Std" to be consistent with IEEE usage.
75.	Editorial.	Renumbered the reference due to the additional and deletion of preceding references.
76.	SRP-UDP format item. Reference verification.	The DEMA Standard could not be obtained from available sources and the DEMA organization is listed as inactive. Therefore this reference could not be verified.
77.	<b>Integrated Impact 715.</b>	Added the applicable date to the reference for the DEMA Standard. The 1974 version of the Standard was in effect at the time the SRP was published and has not been updated.

**SRP Draft Section 9.5.8**  
Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
254	Deletion of reference to BTP ICSB-17 which was superseded by Regulatory Guide 1.9.	II.4, IV.3, and VI.
256	Incorporates the Station Blackout requirements of 10 CFR 50.63 and Regulatory Guide 1.155 with regard to EDGs as alternate ac sources.	I.2, II, III.9, IV, and VI.
715	Added date to DEMA Standard reference.	VI.
798	Updated the IEEE Std 387 reference.	II, and VI.